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INTERNATIONAL PRELIMINARY EXAMINATION REPORT (PCT Article 36 and Rule 70)

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ART 34 AMDT


Applicant's or agent's file reference PVD	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/YU 03/00020	International filing date (day/month/year) 28.07.2003	Priority date (day/month/year) 30.07.2002
International Patent Classification (IPC) or both national classification and IPC B29C45/16		
Applicant PESOVIC, Predrag		

- This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 5 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

 These annexes consist of a total of 7 sheets.

- This report contains indications relating to the following items:
 - ☒ Basis of the opinion
 - ☐ Priority
 - ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - ☐ Lack of unity of invention
 - ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - ☐ Certain documents cited
 - ☐ Certain defects in the international application
 - ☐ Certain observations on the international application

Date of submission of the demand 25.02.2004	Date of completion of this report 05.11.2004
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer Zattoni, F Telephone No. +31 70 340-3202



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**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/YU 03/00020**

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-5 received on 20.10.2004 with letter of 12.10.2004

Claims, Numbers

1, 2 received on 20.10.2004 with letter of 12.10.2004

Drawings, Sheets

2/6-6/6 as originally filed

1/6 received on 20.10.2004 with letter of 12.10.2004

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/YU 03/00020**

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1,2
	No: Claims	
Inventive step (IS)	Yes: Claims	1,2
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1,2
	No: Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement:

1. Reference is made to the following document:

D1: EP-A-1 277 556 (PROGARDEN S P A) 22 January 2003 (2003-01-22)

2. The amendments filed with the letter dated 12.10.04 introduce subject-matter which extends beyond the content of the application as filed, contrary to Article 34(2)(b) PCT. The reasons therefore are as follows:

- 2.1 In the original application, cf. e.g. original claim 1, it is explicitly stated that the "the finishing layer (p) is injection moulded. Although the new filed claim 1 says that "the structure of the layers is placed in the final die intended for forming of a decorative layer (p)", it is not explicitly mentioned that such a layer is injection moulded. Moreover, such a layer has been identified in the new filed claim 1 as a "decorative layer", whereby further subject-matter appears to be added, since in the original application, cf. claim 1, the layer p was identified as a "finishing layer".

- 2.2 In the originally filed claim 1 it is explicitly stated that "the layer 2 is injection molded, whose opposite ribs fill in the cavities between the ribs" of the first layer "and the ribs now protrude out of the" second layer. Contrary to the original disclosure the new filed claim 1 does not explicitly mention the presence of corresponding features.

3. The embodiments described on page 5, lines 9-19, when they refer to a "smooth surface" of the layers 1-n, and the embodiments shown in figures 3, 4, 5, 7, 8, 10, 32 and 33 do not fall within the scope of the claims. This inconsistency between the claims and the description leads to doubt concerning the matter for which protection is sought, thereby rendering the claims unclear, Article 6 PCT.

- 4.1 For the benefit of the procedure, taking into consideration the above mentioned statements it will be hereinafter assumed that claim 1 is as follows:

Injection molding process for producing multilayered plastic products with an open or closed structure, preferably for sanitary products, whereby a first layer (1) with ribbed projections (12) is first formed by injection molding, then the first layer (1) is placed in another die whereby a second layer (2) is injection molded on the entire

surface of the first layer (1) or a part thereof, characterized in that the second layer (2) is formed with ribbed projections (21, 22) on both sides thereof, whereby the ribbed projections on the inner side (21) of the second layer (2) engage between the ribbed projections (12) of the first layer; then the second layer (2) overmolded on the first layer (1) is placed in a further die and a third layer (n) is formed by multistep injection molding, while the ribbed projections thereof (n1) fill the cavities between the ribbed projections (22) of the outer surface of the second layer (2) and further recesses (nu) are formed on the outer surface of the third layer (n); and then the structure so obtained is placed in a final die whereby a finishing layer (p) is injection molded having protrusions (pi) which engage the recesses (nu) of the third layer (3).

- 4.2 Document D1, cf. claim 1, and figure 2, shows Injection molding process for producing multilayered plastic products with an open or closed structure, preferably for sanitary products, whereby a first layer with ribbed projections is first formed by injection molding, then the first layer is placed in another die whereby a second layer is injection molded on the entire surface of the first layer or a part thereof.

Claim 1 differs therefrom in that the second layer is formed with ribbed projections on both sides thereof, whereby the ribbed projections on the inner side of the second layer engage between the ribbed projections of the first layer; then the second layer overmolded on the first layer is placed in a further die and a third layer is formed by multistep injection molding, while the ribbed projections thereof fill the cavities between the ribbed projections of the outer surface of the second layer and further recesses are formed on the outer surface of the third layer; and then the structure so obtained is placed in a final die whereby a finishing layer is injection molded having protrusions which engage the recesses of the third layer.

The objective problem underlying claim 1 is to increase the cross section of the article without compromising dimensional stability, mechanical properties, uniformity of density and cycle time (cf. page 2, lines 17-24).

The combination of features of claim 1, as drafted in paragraph 4.1 of the present application, is not disclosed nor suggested by any of the cited prior art documents, and claim 1 also meets the requirements of Article 33(3) PCT.

20 10 2004

(72)

**METHOD FOR INJECTION MOLDING MULTI-LAYER PLASTIC PRODUCTS AND
MULTI-LAYER PLASTIC PRODUCTS THEREOF**

5 Technical field

The invention refers to the processing and treatment of plastic mass and materials in the plastic state. It also covers multi-layer products.

According to the International Patent Classification (IPC), the invention is classified in
10 B 29C 45 /14 class, which is defined as injection molding of the inserts, B 29C 45/16, which is defined as injection molding of multi-layer or multi-colored objects, B 29 C 63/00, which is defined as over-molding of previously formed layers, B 23B 33/00, which include multi-layer products.

15 Technical problem

This invention solves the problem of multi-layer injection molding of so the articles produced in this fashion have good mechanical properties, such as impact-resistance, scratch-resistance, resistance to breakage, good aesthetic and decorative attributes such as high surface
20 gloss or soft to the touch, and are economic to produce, therefore this is achieved by construction and design of individual layers, constructive bond of the elements in one layer or relationship between thin and thick walls, defining procedure for injection molding so that the appropriate selection of compatible materials in successive injection molding in number of molds, by applying ribbed, grooved, indented, protruding or smooth contact surfaces among
25 layers.

State of art

Technical issues were described in detail in the initial patent application P-571/02. In addition, as relevant to the area, it is necessary to state the following published US patent
30 papers:

References Cited:

US Patents:

1. 3,947,177 - 06/09/1974 - Apparatus For Injection Molding Of Multi-Layer Bodies Of
35 Thermoplastic;
2. 4,840,553 - 20/09/1988 - Metal Mold Structure For Molding Multi-Layer Resin;

3. 4,931,246 - 19/09/1986 - Method For Injection Molding Multi-Layer Articles;
4. 5,141,695 - 08/09/1987 - Injection Molding Method For Multi-Layer Bottomed Parisons;
5. 5,667,819 - 04/11/1994 - Apparatus For Injection Molding Of Multi-Layer Objects;
6. 5,851,456 - 28/03/1997 - Method For Manufacturing A Multi-Layer Product;
- 5 7. 6,129,960 - 10/10/2000 - Methods And Apparatus For Injection Molding And Injection Blow Molding Multi-Layer Plastic And Articles Made Thereby;

EP Patent:

1. EP 1 227 5567 A1 Method for producing, by injection moulding, a plastic body provided
10 with localized protuberances.

All the stated patents refer to apparatus and processing for simultaneous injection molding of multi-layer materials. Such a manner of molding the multi-layer materials employs extremely complex devices and molds, and complex multi-tube nozzles. Furthermore, it
15 requires extremely complex control of viscosity, flow and temperature of materials that are being molded in various layers, which all makes the whole process even more complex, thus tending to be imprecise, ineffective and uneconomic. Some of the named processes include a combination of both injection molding and blow molding.

Generally, they all allow injection molding or blow molding of several layers of various
20 materials, whose wall thickness is mainly uniform. In all the previously named technologies it is practically impossible to increase the cross-section (thickness of the multi-layer wall) from several times up, to several dozens times up, without compromising technical and technological requirements of the process, which are contained in: technical openings dimensions, if any, parts dimensions, aesthetics, mechanical properties, uniformity of density of material by layers,
25 and plastic mass processing technology (processing and cooling time of injection molded layers).

Disclosure of the invention

30 This invention refers to the procedure of injection molding multi-layer plastic products. Technological procedure is defined in regards to the materials and their combinations in layers, depending on the sanitary – technical requirements in water-sanitary fixtures. The said application also refers to other technical and technological elements and finished products not in

use in manufacturing process of water-sanitary products technology, but are subject to strict and precise technical and technological requirement.

According to this invention, the procedure is defined in successive injection molding of a (either thin or thick) layer upon already molded layer(s), and the first layer is injection molded
5 in mold with a solid core, if it is part with a closed structure, or without a core, if it is a part with an open structure produced via already known methods. This procedure allows injection molding of 'n' layers, depending on the technical and technological requirements set for the final product.

Construction of the product itself is defined by a number of layers and their thickness,
10 constructive bond between them (contact surface), quality (roughness) of the contact surface between the layers and construction of the first layer, depending on the requirements set for the final product.

When closed product structures are in question, they are mostly complicated shapes, which require hermetic (sealing and water-tight) properties, so the first layer must be made in
15 segments, which are joined in several ways and then over-molded with another layer, and in another mold.

According to this invention, advantages in construction and procedure of injection molding multi-layer plastic products are obvious in relation to the existing state of art. Furthermore, we should emphasize that the invention opens up unlimited possibilities in
20 meeting the most difficult technical, technological, and sanitary requirements, where the thickness of an individual layer, or the whole product, is practically unlimited, while never compromising technical and technological requirements contained in technical openings dimensions, if any, parts dimensions, aesthetics, mechanical properties, uniformity of density of material by layers, and plastic mass processing technology (processing and cooling time of
25 injection molded layers).

Detailed description of the invention

The invention is described in detail in enclosed figures:

- 30
- Fig. 1 - closed structure multi-layer product cross-section;
 - Fig. 2 - open structure multi-layer product cross-section;
 - Fig. 3 - three-layer product cross-section;
 - Fig. 4 - two-layer product cross-section;
 - Fig. 5 ÷ 8 - cross-sections of thin layers with protruding, indented and smooth surface;
 - 35 • Fig. 9 ÷ 12 - cross-sections of thick layer with ribbed structure (grooves in between the ribs);

- Fig. 13 ÷ 28 - some of the possible shapes of protrusions and indentations in thin and thick layers and their surface positioning;
- Fig. 29 - ribbed structure with straight ribs;
- Fig. 30 - ribbed structure with circular ridges;
- 5 • Fig. 31 - net-like ribbed structure;
- Fig. 32 - cross-section of a product with the first layer elements joined with an 'O' ring, and
- Fig. 33 - cross-section of a product with the first layer elements joined without an 'O' ring.

10 Injection moulding process for multilayer plastic products is carried out in such way that first layer 1, more exactly segments 1' and 1" thereof are formed first by injection moulding, disregarding if the product concerned is having a closed structure /Figs. 1 and 32/. Ribbed
projections 12 are formed on the outer surface of the first layer 1. In each of the segments 1' and
15 1" a hole 11 is formed using a stiff core in the die or by any other means, which hole 11 is the most often intended for fluid flowing therethrough, that implies it has to be made of fluid-tight material, as well as the above mentioned segments 1' and 1" have to be joined hermetically. For that purpose they are interconnected either by releasable or non-releasable connection, but it must be hermetical in any case. The releasable connection between the segments 1' and 1" is realized by means of a sleeve 13 having either an appropriate groove into an O - ring is mounted
20 or snap fasteners (not shown in drawings); the non-releasable connection is provided via the sleeve 13 by means of gluing, heating, press fit or ultrasonic welding.

The first layer 1 formed in such way that consists a support for product to be made is being positioned very precisely in another die and onto the outer surface thereof a second layer is formed by injection moulding, whose ribbed projections 21 fill the cavities between the
25 ribbed projections 12 of the first layer 1. The ribbed projections 22 of the second layer 2 protrude from the outer surface of the second layer 2. The first and second layers /1 and 2/ that form an integral part now are being positioned in an another die where is carried out injection moulding of the third layer 'n' having the ribbed projections 'n1' and the recesses 'nu' on the outer surface thereof. The protrusions n1 of the third layer 'n' fill the cavities between the ribbed
30 projections '22' of the second layer '2'. Over the layer 'n' a decorative layer 'p' is formed by injection moulding, whose protrusions 'pi' engage the recesses 'nu' of the layer 'n' forming in such way a homogeneous structure between the third layer 'n' and the decorative layer 'p'.

The outer surface of the decorative layer "p" can be arbitrary coloured or it can be transparent, and in respect to the quality, said surface can be smooth as polished or rough, more
35 exactly in the form of a profile with desired pattern.

If the product concerned has an open structure /Fig. 2./, the injection moulding process is same as explained above, except that the first layer /1/ is not formed of the segments 1' and 1'', but integrally and one of its surfaces can have final quality in the case if it should not be covered by the second layer.

5 The layers 1 to 'n' can be formed either as thin layers "ts" or as thick layers "ds", as well as a combination thereof, while the decorative layer 'p' is preferably formed as a thin layer. Thickness of the thin layer "ts" varies within a range between 0.5 and 6 mm, while thickness of the thick layers varies within a range between 4 and 30 mm.

10 The surfaces of the thin layers "ts" can be smooth or having protrusions "tsi" and recesses "tsu" or ribbed projections or any combination thereof with the smooth surfaces. The protrusions "tsi" and the recesses "tsu" /Fig. 6/ have circular, square or any other suitable geometrical shape, while they can be placed either in checkered arrangement or in any other suitable symmetrical or asymmetrical arrangement /Figs 13-28/..

15 The surfaces of the thick layers "ds" can be smooth or having protrusions "dsi" and recesses "dsu" or ribbed projections "ds1", "ds2" /Figs. 9 - 12/ or any combination thereof with the smooth surfaces, wherein their cross-sections have square, rectangular, triangular, trapezoid, semicircular or any other suitable geometrical shape. They can be arranged on the surfaces of the layers 1 to n in a form of parallel ribs that can be either straight or convex, or they can form a web "m" or any other suitable arrangement /Figs. 29 - 31/.

20 It will be apparent from the foregoing that the process according to the present invention provides a wide range of possibilities of the production of the multilayer products, wherein a number of combinations of shapes, arrangements, thickness of layers and kinds of materials to be used is practically unlimited without departing from the scope of the claims which follow.

25

PATENT CLAIMS

(72)

1. Injection moulding process for multilayer plastic products primarily for sanitary and other products, characterized in that the first layer having thickness /ds/ with ribbed projections /12/ is formed first by injection moulding, disregarding if the part to be produced has either open or closed form, then the precisely positioned first layer is placed in the another die and filled with second layer by injection moulding on its entire outer surface or a part thereof, then the first layer moulded in the second layer with ribbed projection /22/ is positioned in the next die and the third layer is formed by multistep injection moulding, while the ribbed projections /n1/ thereof fill the cavities between the ribbed projections /22/ of the second layer and the recesses /nu/ are formed on the outer surface of the third layer, and then the structure of the layers is placed in the final die intended for forming of a decortive layer /p/ having protrusions /pi/ which engage the recesses /nu/ of the third layer.
2. Construction of multilayer plastic products according to claim 1, characterized in that the first layer consists of the segments /1', 1''/ that are interconnected releasable by means of sleeve /13/ with O - ring /14/ or non-releasable in a zone of the outer surface of the sleeve /13/ by gluing, heating, press fit or ultrasonic welding.

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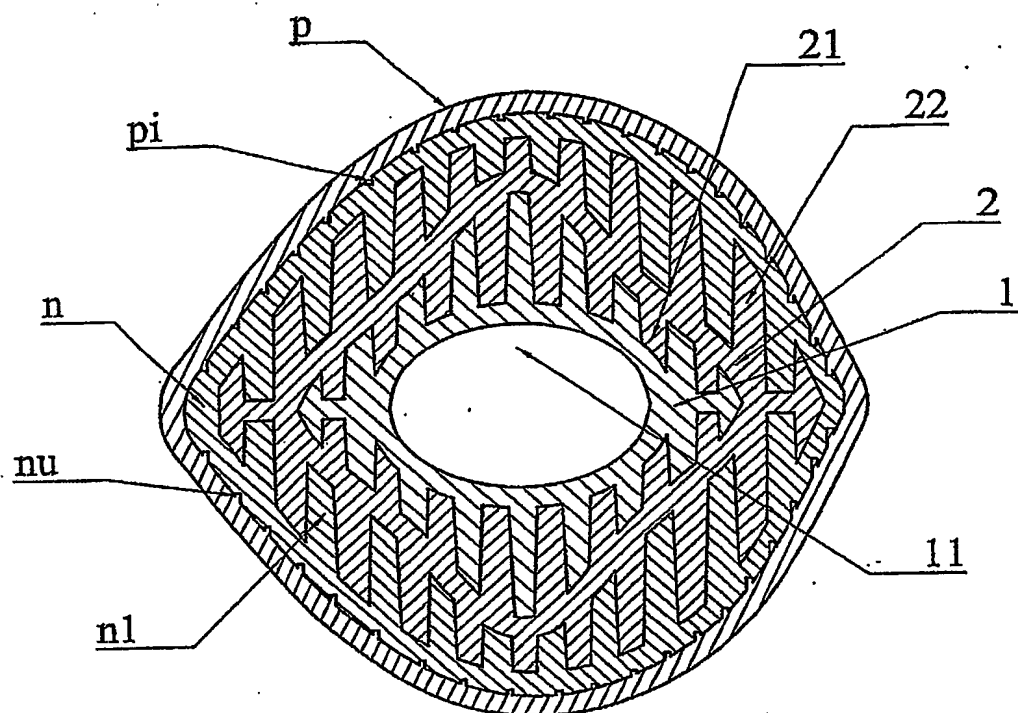


Fig.1

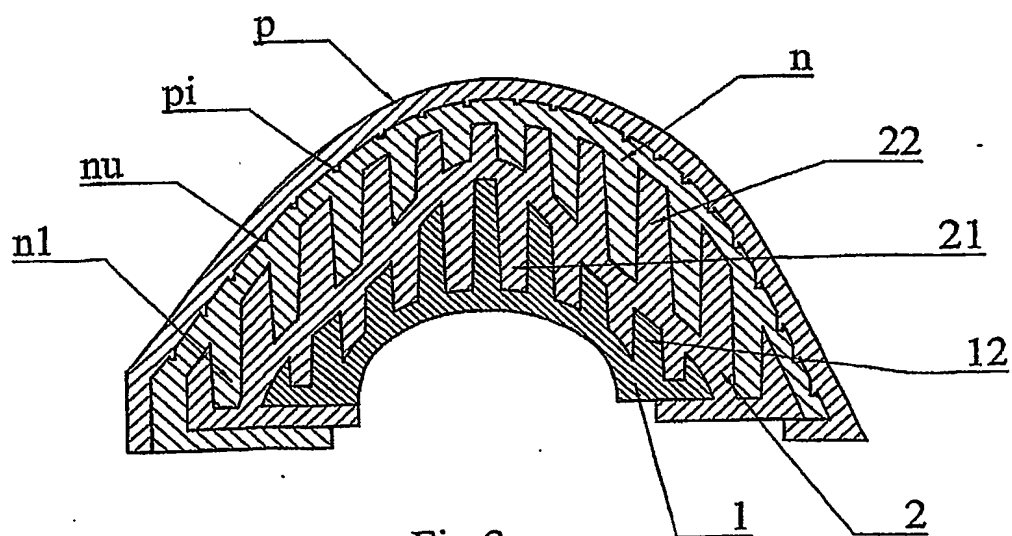


Fig.2

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